(PRELIMINARY)

1250-LB. A. P. ROCKET BOMB MARK 50 AND FUZES MARK 150 AND MARK 151

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NAVY DEPARTMENT

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CONFIDENTIAL

ORDNANCE PAMPHLET 1220 (PRELIMINARY)

1250-lb. Armor-Piercing Rocket Bomb Mark 50 and Fuzes Marks 150 and 151

1. Ordnance Pamphlet 1220 (Preliminary) contains a description of the 1250-lb. Armor-piercing Rocket Bomb Mark 50 and the Fuzes Marks 150 and 151 which are used in conjunction with this bomb. It presents instructions for assembly and loading into aircraft, as well as general performance data of this bomb and its fuzes.

2. This publication is for the use of all personnel concerned with the operation and handling of the 1250-lb. Armor-piercing Rocket Bomb Mark 50 and the Fuzes Marks 150 and 151.

3. Because of the urgent need for this information, it has been issued in preliminary form. This Ordnance Pamphlet will be revised and issued in complete, final form as soon as practicable.

4. This pamphlet does not supersede any existing publication.

5. This publication is CONFIDENTIAL and should be safeguarded and handled in accordance with the current edition of the Registered Publication Manual and Article 76, U. S. Navy Regulations, 1920.

G. F. Hussey, Jr.
Rear Admiral, U. S. Navy
Chief of the Bureau of Ordnance

CONTENTS

		Page
1.	**GENERAL**	5
2.	**DESCRIPTION**	5
	General	5
	A. P. Bomb	5
	Propelling Chamber	5
	Propellant	7
	Tail Assembly	7
3.	**USE AND PERFORMANCE**	8
	Release Altitudes	8
4.	**TAIL FUZE MK 150**	8
	General	8
	Description	8
	Operation	9
	Arming Time	9
	Safety Precaution	9
	Disassembly	9
5.	**FUZE AND INITIATING DEVICE MK 151**	9
	General	9
	Description	9
	Operation	10
	Arming Time	12
	Explosive Components	12
	Safety Features	12
	Disassembly	12
6.	**ASSEMBLY**	12
	Procedure	12
7.	**INSTALLATION IN THE PLANE**	14
8.	**SHIPPING**	14
9.	**INFORMATION FOR STOWAGE**	14
10.	**SAFETY PRECAUTIONS**	15

Figure 1.—1250-lb. A. P. Rocket Bomb Mk 50

Section 1
GENERAL

The 1,250-lb. A. P. Rocket Bomb Mk 50 is designed for dropping from dive bombers on armored targets. The propelling chamber or rocket gives an additional 180 f.p.s. velocity in order to obtain better armor penetration.

Two tail fuzes are used in the bomb. The Tail Fuze Mk 150 serves to detonate the explosive filling in the bomb proper after impact and penetration. The Fuze Mk 151 serves to initiate the propelling charge and to arm the Fuze Mk 150.

Section 2
DESCRIPTION

GENERAL

The unit consists of a rocket assembly attached to the after end of a 1,000-lb. A. P. bomb.

ARMOR-PIERCING BOMB

The bomb used in this unit is the 1,000-lb. A. P. Bomb AN–Mk 33 with a slight modification. The base plug of Bomb AN–Mk 33 has been redesigned in order that the Tail Fuze Mk 150 will be completely below the outer surface of the base plug and in order that the motor base can be attached by six screws. When the bomb strikes the target, these screws shear, thereby detaching the propellant unit.

For a detailed description of the 1,000-lb. A. P. Bomb AN–Mk 33, see Ordnance Pamphlet 1019.

PROPELLING CHAMBER

The propelling chamber is constructed of seamless steel tubing and forged so that the after end forms a nozzle. The forward end of the chamber is internally threaded so that it may be secured to the motor base. The motor base is secured to the base plug of the bomb by six screws.

Figure 3.—Tail assembly, Propellant Chamber, Motor Base, and Shroud

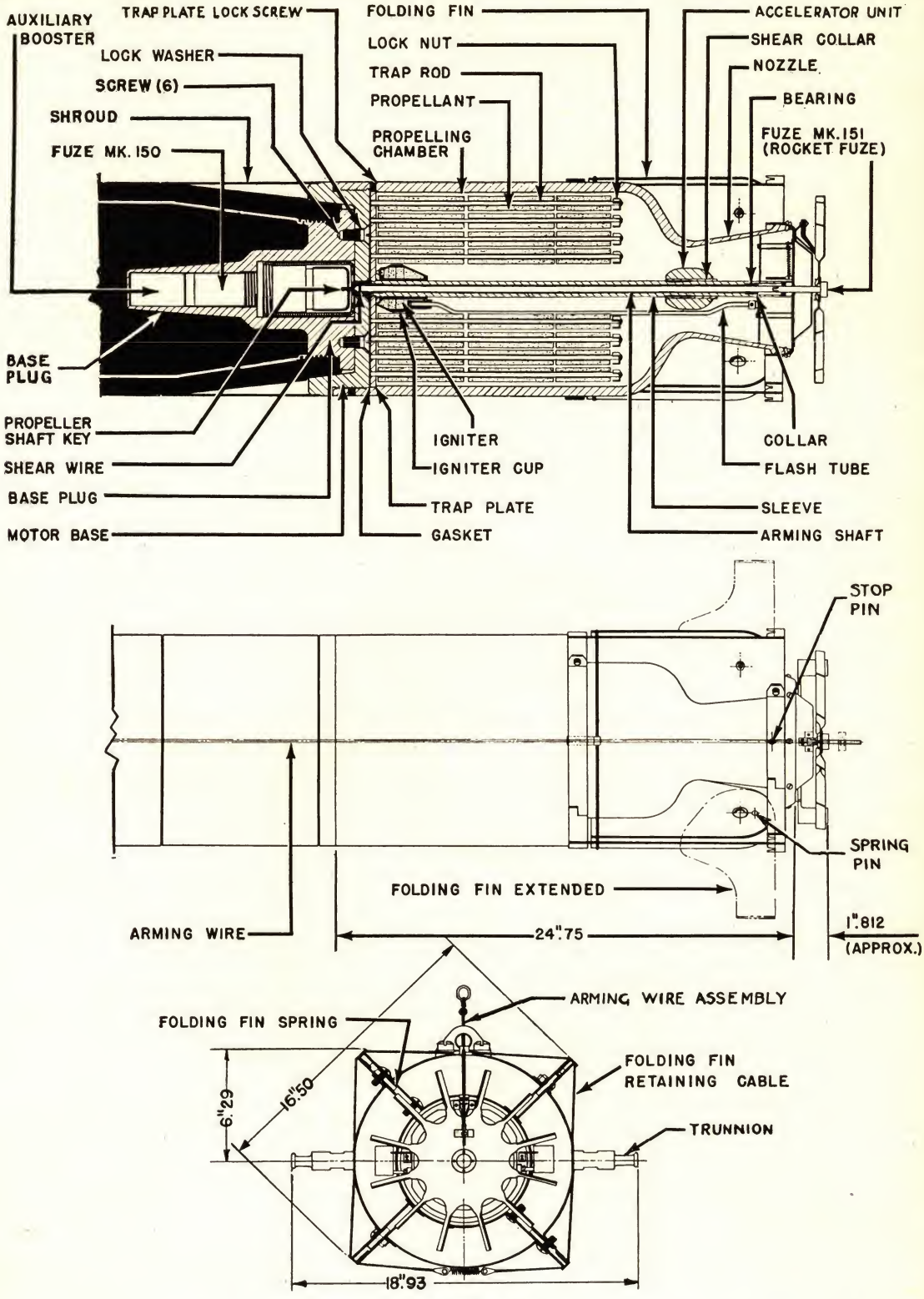

Figure 2.—BuOrd Dwg. 394661, 1250-lb. A. P. Rocket Bomb Mk 50

A trap plate is fitted into the forward end of the chamber. Mounted on the trap plate are 74 trap rods on which are placed the propellant grains. A steel sleeve which houses the arming shaft for the Fuze Mk 150 extends from the trap plate back to the nozzle. A shear valve unit, which provides a wide temperature range over which the rocket will function, is screwed onto the sleeve so that it is located in the nozzle throat. A cylindrical shroud is provided to fit over the motor base and after end of the bomb to complete the streamlining. The first design of the assembly called for a long cylindrical shroud which was fitted over the base of the bomb and the propellant chamber. Forty units with this long shroud are to be shipped for use with the short motor base. Thus, the long shroud is for use with the short motor base, and the short shroud for use with the long motor base. The shipping crates and parts are appropriately marked, and the proper shrouds and bases are shipped together.

PROPELLANT

The propellant consists of 29 lbs. of solvent-extruded double-base smokeless powder in the form of grains five inches long with an outer diameter of $\frac{7}{8}$ in. and an inner diameter of $\frac{1}{4}$ in. Two and one-half grains are placed on each trap rod and held by the lock nut on the after end of the rod. The igniter charge, 100 grams of FFG black powder, is housed in a cellulose acetate igniter cup. The igniter cup slips over the sleeve on the trap plate. A 0.25-in. flash tube extends from the Fuze Mk 151 to the igniter cup.

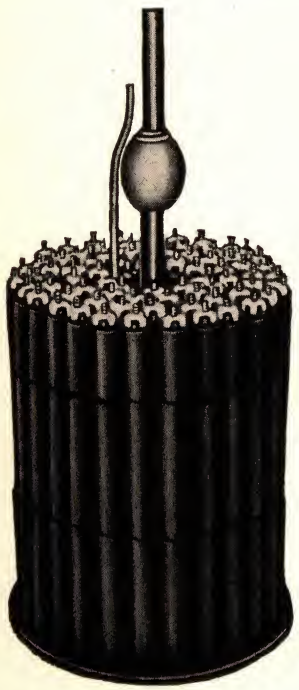

Figure 4.—Propellant Mounted on Trap Plate

THE TAIL ASSEMBLY

The folding fin assembly consists of four stationary fins to which are attached four additional fins which spring out when the arming wire is withdrawn.

The four stationary fins are secured to two steel bands; the forward band is split and held together by a tightening bolt. This band is fitted over the chamber, and tightly secured to the chamber by the tightening bolt. The after band is continuous and fits over the nozzle end of the chamber.

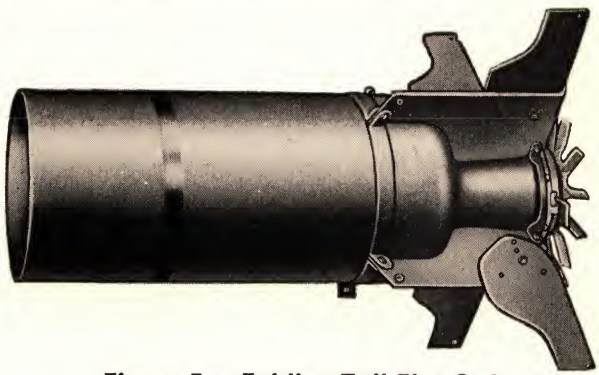

Figure 5.—Folding Tail Fins Out

Each folding fin is secured to a stationary fin by a screw. A coiled spring around the securing screws causes the folding fins to snap out when the arming wire is pulled. The folding fins are retained by a cable around the tail assembly. The cable consists of two lengths of wire, one end of each length attached to a spring, the other end terminating in an eyelet. The arming wire passes through a bridge clip on the forward band, and through each eyelet, thereby securing the cable around the fins. When the arming wire is pulled, the eyelets are no longer joined, the spring causes the cable to fly away, and the folding fins snap out (see Fig. 5). A shipping cord is around the tail assembly during shipping and prior to the installation of the cable and arming wire.

Section 3
USE AND PERFORMANCE

This unit is designed for use from dive bombers and to be dropped on the same type targets as the 1,000-lb. A. P. Bomb AN–Mk 33. The rocket assembly does not appreciably change the bomb trajectory from that of the 1,000-lb. A. P. Bomb AN–Mk 33 when released under normal dive-bombing conditions. The rocket assembly adds about 180 feet per second to the velocity of the bomb at the time the rocket is initiated. The chart below outlines the general effect of this added velocity.

Altitude at Release	Striking Velocity of Bomb AN–Mk 33	Thickness of Horz. Class B Armor Penetrated	Striking Velocity of Rocket Bomb Mk 50	Thickness of Armor Penetrated
1,500 ft.	480 ft./sec.	2.3	660	3.5
2,000 ft.	510 ft./sec.	2.5	690	3.8
2,500 ft.	540 ft./sec.	2.7	720	4.0
3,000 ft.	565 ft./sec.	2.9	745	4.3
3,500 ft.	590 ft./sec.	3.1	770	4.5
4,000 ft.	615 ft./sec.	3.3	795	4.7
4,500 ft.	640 ft./sec.	3.5	820	4.9

RELEASE ALTITUDES

The rocket propellant is ignited after approximately 1000 ft. of air travel following release. The propellant, after ignition, will burn for 0.45 seconds at —50 F to 0.1 seconds at + 130 F. The latter temperature is the maximum safe operating limit for the rocket assembly. When released in a 60° dive at 220 knots, the value of 0.45 second is equal to a distance of about 200 feet along the bomb's trajectory, while the time of 0.1 second is equal to about 45 feet. Therefore, allowing for the 1000 feet of air travel required prior to the initiation of the rocket, the minimum release altitudes required for complete functioning when released in a 60° dive at 220 knots are (1000 + 200) cos 30° or 1040 feet at — 50 F and (1000 + 45) cos 30° or 905 feet at + 130 F. Minimum release altitudes for this bomb from the standpoint of safety to the dropping aircraft are governed by instructions as issued by Commander in Chief, U. S. Fleet, for bombs of all weight classes. Both the Fuze Mk 150 and the Fuze Mk 151 are safe for take-offs and landings anywhere, including aircraft carriers.

Section 4
TAIL FUZE MK 150

GENERAL

The Tail Fuze Mk 150 is an air-arming, impact-firing fuze. It is designed to detonate the main charge in the bomb with a delay of approximately 0.08 (± 0.01) second after impact. This delayed action allows the bomb to penetrate the target prior to detonation.

DESCRIPTION

This fuze is the Fuze AN–Mk 228 modified for use in the rocket bomb. The modification consists of the replacement of the milk-bottle-shaped protecting cover of the Fuze AN–Mk 228 by a shorter barrel-shaped cover with a large circular hole in the top to permit arming, and two spanner holes to

facilitate assemblage in the bomb. This modified cover and the deeper recess in the base plug of the bomb permit the fuze to fit completely below the outer surface of the base plug.

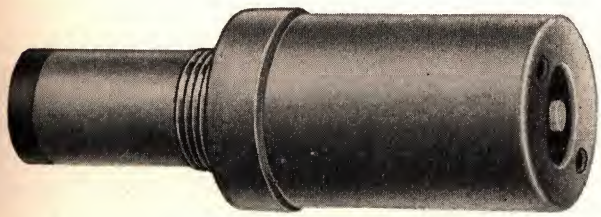

Figure 6.—Fuze Mk 150

Arming is accomplished by the rotation of the vanes on the Fuze Mk 151 located on the nozzle of the propelling chamber. A tongue is secured to the operating shaft by a copper shear wire, and the operating shaft is secured to the vane shaft of the Fuze Mk 151 by a tongue and groove joint. Thus, the rotation of the vanes of the Fuze Mk 151 is transferred directly to the Fuze Mk 150 on the base of the bomb.

OPERATION

When the bomb is released, the arming vane is operated by the wind stream and begins to arm both fuzes. After 150 revolutions, the Fuze Mk 150 is armed and the shear wire securing the tongue to the operating shaft is sheared. Thereafter, the vanes continue to rotate and fire the Fuze Mk 151 after an additional 80 revolutions. On impact, the Fuze Mk 150 is fired, and after a delay of 0.08 ($\pm$ 0.01) second, the main charge in the bomb is detonated. For a detailed description of the alignment of the firing train and the initiation of the explosives, reference is made to the description of the Fuze AN–Mk 228 contained in Ordnance Pamphlet 988.

ARMING TIME

It requires 150 rotations of the vanes of the Fuze Mk 151 to arm this fuze. This is accomplished after approximately 650 feet of air travel.

SAFETY PRECAUTIONS

The same safety precautions observed with the Fuze AN–Mk 228 will be observed with this fuze.

DISASSEMBLY

The same disassembly procedure as used with the Fuze AN–Mk 228 will be observed with this fuze.

Section 5

FUZE AND INITIATING DEVICE MK 151

GENERAL

This fuze is a mechanical fuze of the arming vane type. It is designed to initiate the propellant during the downward flight of the bomb, and also to arm the Fuze Mk 150 located in the base of the bomb.

DESCRIPTION

The arming vane (see Fig. 9) is secured to the vane shaft by a pin. The arming wire passes through the arming wire attachment on the fuze body and the arming vane. Positively attached to the vane shaft is the planetary gear. As the vanes rotate, the planetary gear is caused to move about an upper and lower gear. The upper gear has 20 teeth and is stationary; the lower gear has 21 teeth and is positively attached to the cam plate. Thus, it requires approximately 230 revolutions of the vanes to cause the cam plate to rotate once. On the under side of the cam plate is located a driving gear which rotates as the cam plate rotates. The driving gear meshes with the teeth on the sector, causing the sector to move in a counter-clockwise direction. An arm extends from the sector to the cartridge chamber, and as the sector is caused to rotate the cartridge chamber moves around, aligning the cartridge with the flash tube. A copper holding piece is placed on the cartridge chamber arm to retain the cartridge after it is fired to maintain a seal.

The spring-loaded firing hammer is held in the safe position by a latch secured to a cam follower.

The cam follower has a small projection which rides in a groove in the cam plate. This groove is so located on the plate that when the cam plate has made one complete revolution the cam follower causes the latch to trip, releasing the spring-loaded firing hammer.

To prevent the firing of the fuse prior to the release of the bomb, two wind vanes are attached to a safety rod extending through the fuze. Secured to the safety rod is a safety stop which rests in the path of the firing hammer assembly. The safety stop spring is so tensioned that the stop will keep the firing hammer in a safe position and prevent the accidental firing of the propellant unless the wind vanes are subjected to an air velocity of at least 100 knots. When the air stream is 100 knots or more, the wind vanes are caused to move back, and the safety stop is accordingly moved out of the path of the firing hammer assembly.

A protective cover is placed around the reduction gear assembly. There is a glass window in the cover to serve as an inspection port to show the condition of the fuze. A brass indicator is attached to the geared sector. The position of the indicator in relation to the brass arc containing the words "Start" and "Armed" gives the condition of the fuze. It is to be noted: *In this fuze, when the indicator passes the word "Armed", the fuze fires.*

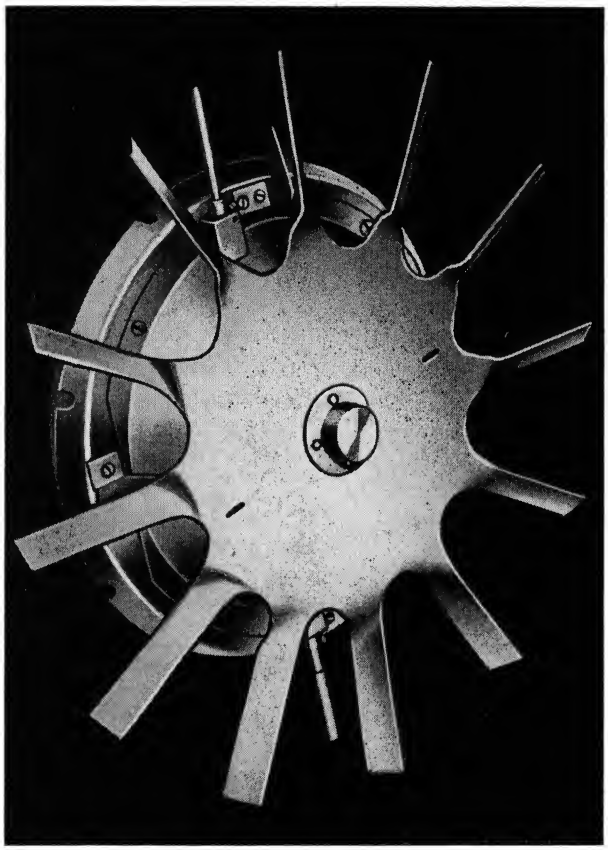

Figure 7.—Fuze and Initiating Device Mk 151 (Top View)

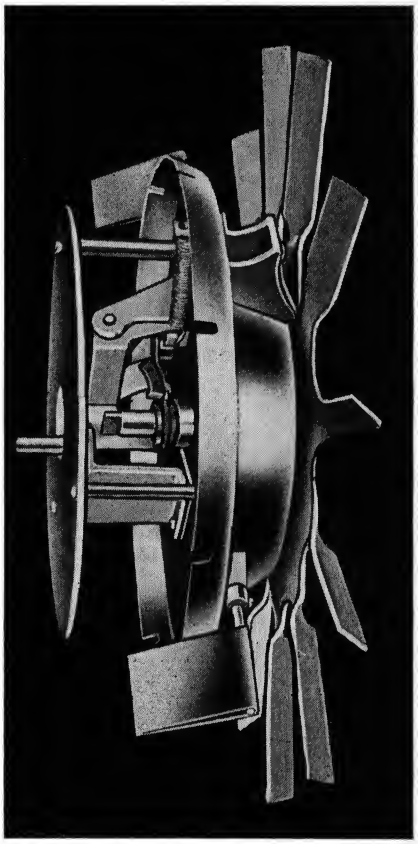

Figure 8.—Fuze and Initiating Device Mk 151 (Side View)

OPERATION

When the bomb is released, the arming wire is withdrawn, and the vanes are free to rotate. When the rate of fall is 100 knots or more, the wind vanes flip back and move the safety stop from the path of the firing assembly. Rotation of the vanes does two things: (1) arms the Fuze Mk 150 through the arming shaft and (2) causes the planetary gear to move about the upper and lower gears. After 150 revolutions of the vanes, the Fuze Mk 151 is armed. The shear pin securing the tongue to the operating

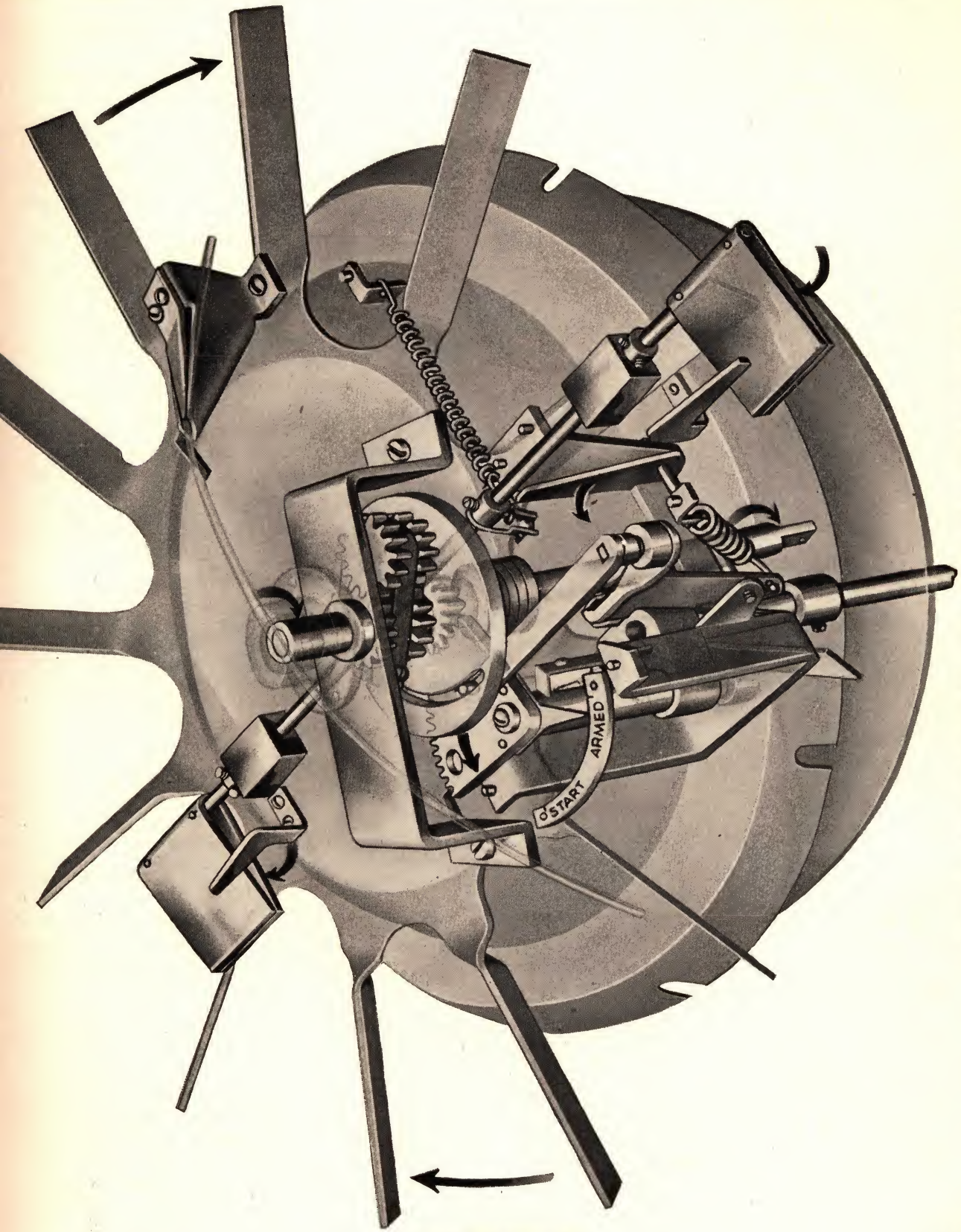

Figure 9.—Fuze and Initiating Device Mk 151 (Perspective Drawing)

shaft shears and permits further rotation. After approximately 230 revolutions of the vanes, the cam plate will have completed one revolution; the cartridge carrier is lined up with the flash tube; the cam actuates the safety stop, tripping the spring-loaded firing assembly; and the firing hammer fires the cartridge. The flash from the cartridge passes down the flash tube, which initiates the igniter and consequently the propellant charge.

ARMING TIME

It requires 150 revolutions of the vanes to arm the Fuze Mk 150, and 230 revolutions to fire the Fuze Mk 151. This firing will occur after approximately 1,000 feet of air travel.

EXPLOSIVE COMPONENTS

The only explosive contained in the fuze is a caliber .22 short cartridge filled with black powder.

SAFETY FEATURES

The following safety features are incorporated into the Fuze and Initiating Device Mk 151:

(1) The cartridge is not aligned with the flash tube and the path of the firing assembly until after approximately 225 revolutions of the arming vanes. If the cartridge is inadvertently fired prior to alignment, the flash plate prevents the ignition of the propellant.

(2) The safety stop prevents the firing assembly from engaging the cartridge, even if the fuze is completely armed, unless the wind vanes are subjected to an air velocity of 100 knots or more.

(3) During shipment each fuze is individually packed in a metal container and locked in the unarmed condition with a sealed shipping wire.

DISASSEMBLY

No disassembly of this fuze is authorized.

Section 6
ASSEMBLY

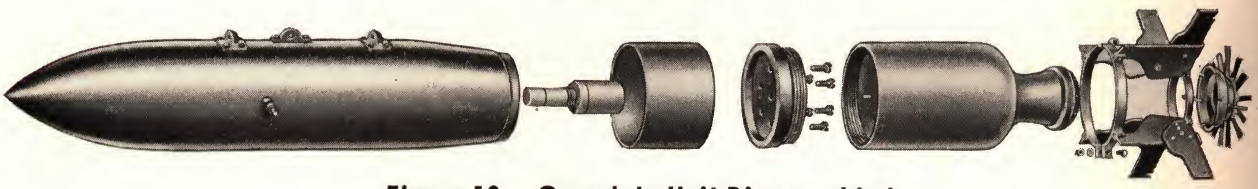

Figure 10.—Complete Unit Disassembled

It is suggested that the rig shown in Fig. 11 be used for assembling the unit. A pair of two-inch rails are secure to two wooden blocks, and the unit is attached to a Bomb and Torpedo Truck Mk 5 Mod 1.

PROCEDURE

The assembly procedure is listed chronologically below:

(1) Remove the safety wire and safety key from Fuze Mk 150. Screw the fuze into the base plug of the bomb. Use a face spanner wrench with 2¼-in. spaced pins of ¼-in. diameter.

(2) Place the shroud on the bomb. The shroud marked "long shroud" is to be used with the short motor base, and the "short shroud" with the long motor base. The shrouds and motor bases are appropriately marked, and the proper pairs are shipped together.

(3) Secure the motor base to the base plug of the bomb with the six screws and lock washers provided.

(4) Before screwing the chamber to the motor base, check the operating shaft for a spinning fit and check the tongue on the shaft to be sure that the shear wire is in place.

(5) Screw the chamber onto the motor base. A strap wrench can be used for this operation. The chamber should be secured with the set screw provided. A wrench for a 5/16-in.—18 set screw with 5/32-in. distance across flats is required.

(6) Remove the shipping cap on the nozzle end of the chamber. Use a screw driver on the nozzle end of the operating shaft to be sure that the tongue is seated in the slot in the cup of the Fuze Mk 150. The shaft should jam when rotated counter-clockwise. Since the Fuze Mk 150 requires 150 rotations

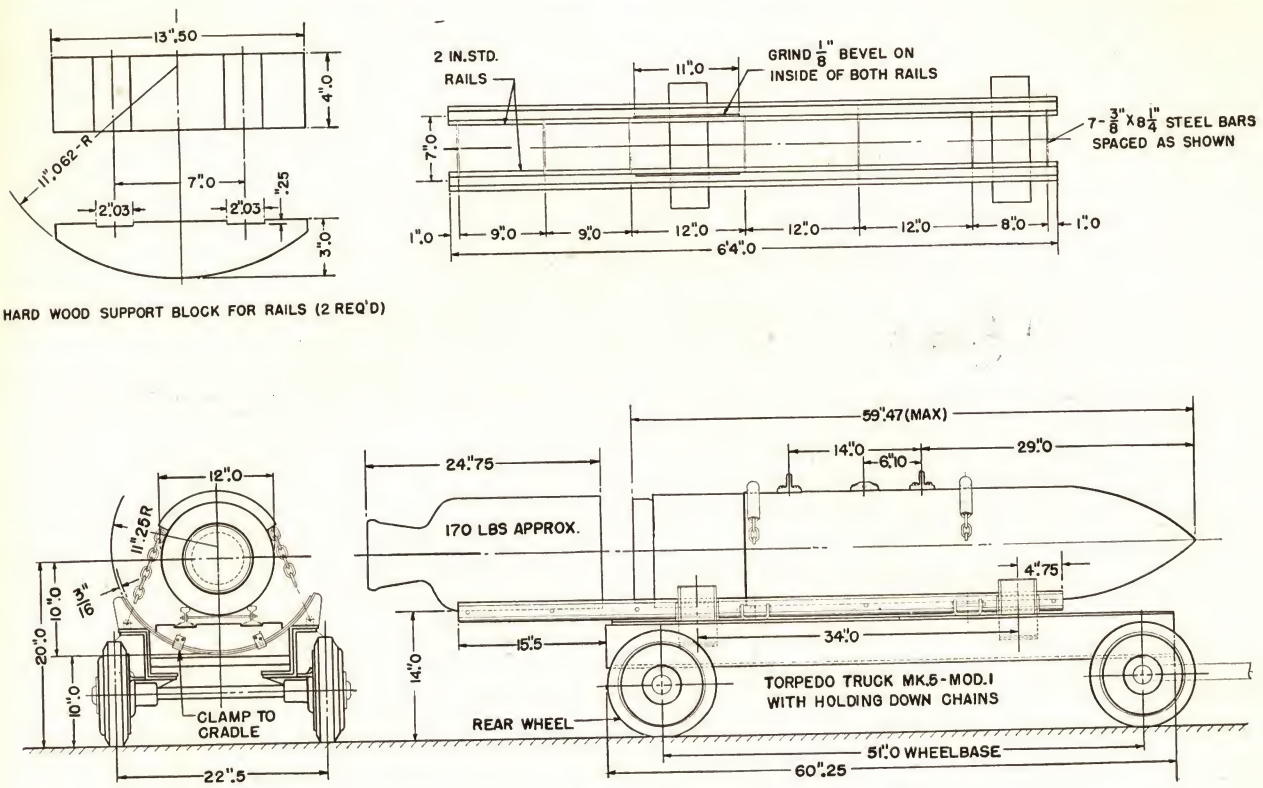

Figure 11.—BuOrd Dwg. 422652, Assembly Rig

to arm, there is no danger in rotating the shaft three or four turns in a clockwise direction to insure free movement.

(7) In assembling the tail fins onto the chamber, remove the four nuts and bolts at the after end (small diameter band) so that the fins can be folded out a sufficient distance to fit over the end of the nozzle. (See Fig. 12.) The band at the after end should be pushed far enough forward on the ridge on the nozzle so that the Fuze Mk 151 will fit on the tapered end. The four nuts and bolts previously removed should now be replaced. The tail assembly should be rotated so that the suspension lugs are in line with a plane bisecting two adjacent tail fins. The bridge clip for the arming wire should be placed under the forward band of the tail assembly and in line with the suspension lugs. By tightening the bolt and nut on the forward band, the tail and bridge clips are secured. The purpose of the bridge clips is to support the eyelets of the folding fin retaining cable so that the arming wire can be withdrawn without binding.

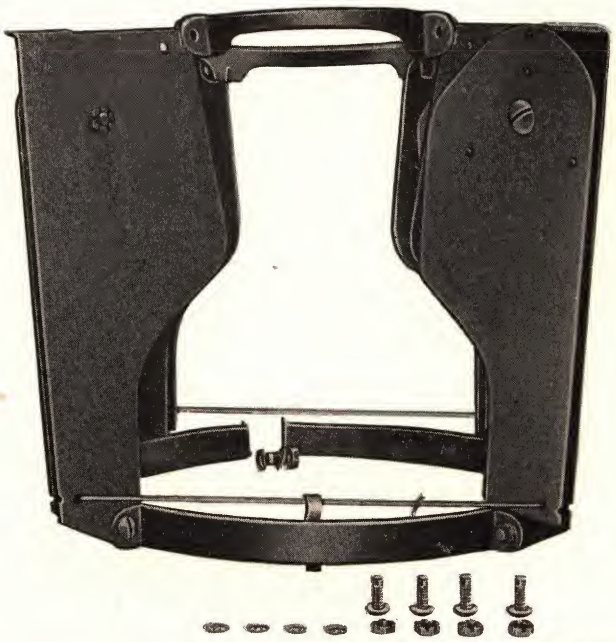

Figure 12.—Tail Assembly with Four Bolts and Nuts Removed from After Band

(8) Place the folding fin retaining cable around the forward end of the tail assembly so that the eyelets will cross under the bridge clip. The arming wire is then passed through the bridge clip and eyelets of the retaining cable. Then the cotton shipping cord should be cut and removed.

(9) Remove the tape holding the 0.25-in. flash tube and pull the flash tube several inches from the nozzle, so that it can be inserted in the adapter of the Fuze Mk 151. The flash tube should be pushed in until it strikes the shoulder in the adapter, and then secured with the set screw provided. The set screw is 6-32 with 1/16-in. flats. If a wrench is not available, it can be tightened sufficiently with sharp-nosed pliers.

(10) Clip the lead-sealed safety wire from the Fuze Mk 151 and insert the short bronze safety wire. Place the fuze on the nozzle and rotate the fuze body to engage the shafts. If desired, the arming vane may be rotated two or three times to facilitate this assembly. The spring-clip arming wire attachment on the fuze plate should be aligned with the suspension lugs on the bomb. The eight screws securing the fuze to the nozzle should be secured and the bronze safety wire removed. The arming wire is then passed through the spring clip arming wire attachment and the hole in the arming vane assembly. A Fahnestock clip should be attached to the end of the wire.

Section 7
INSTALLATION IN THE PLANE

The installation of the complete unit in the plane is identical to the 1,000-lb. A. P. Bomb AN–Mk 33. The bomb attachments have been moved toward the chamber to accommodate the new center of gravity.

Section 8
SHIPPING

The complete round assembly for the 1,250-lb. A. P. Rocket Bomb Mk 50 is shipped in four parts as indicated below:

(1) The armor-piercing bomb is shipped alone.

(2) The Fuze Mk 150 is shipped in a hermetically sealed can; four cans to a crate.

(3) The chamber crate contains the following items:

(a) The chamber loaded with propellant and igniter.

(b) The operating shaft and tongue assembled with copper shear wire for the Fuze Mk 150.

(4) The tail crate contains the following items:

(a) The tail assembly.

(b) The motor base.

(c) The shroud (appropriately marked "long" or "short" shroud, depending on the motor base in the crate).

(d) A container containing the Fuze Mk 151.

(e) A bag containing seven screws and seven lock washers for securing motor base to base plug of bomb (one extra screw and lock washer).

(f) A bag containing bomb attachments (two trunnions and lock washers, one hoisting lug with two cap screws, and two suspension lugs with eight cap screws).

(g) A bag with the folding-fin retaining cable and bridge clip.

(h) Two hooks to lift the motor base from the crate.

Section 9
INFORMATION FOR STOWAGE

The armor-piercing bomb and the Fuze Mk 150 are to be given standard stowage for bombs and fuzes.

All material in the tail crate is inert except the caliber .22 short cartridge, which contains black powder. This cartridge is mounted in the Fuze Mk 151, which is enclosed in a metal container.

The chamber crate contains the propellant cham-

ber loaded with 29 pounds of solvent-extruded double-base powder and the igniter containing 100 grams of FFG black powder. While in the crate, the chamber is essentially non-propulsive, since the forward end affords small restraint. The same regulations that apply to the stowage of smokeless powder apply to the stowage of the tail crate.

Section 10

SAFETY PRECAUTIONS

The 1,250-lb. A. P. Rocket Bomb Mk 50 and the Fuzes Mk 150 and Mk 151 are subject to the same safety precautions as current service types of bombs and fuzes.

All instructions promulgated in this pamphlet must be carefully and completely followed.

The 1,250-lb. A. P. Rocket Bomb Mk 50 and the Fuzes Mk 150 and Mk 151 are safe for take-offs and landings anywhere, including the decks of aircraft carriers.

In case the 1,250-lb. A. P. Rocket Bomb is not dropped, it should be completely disassembled, following the reverse of the assembly instructions contained in this pamphlet, and all parts returned to their original condition and stowage.

Stowage of the component parts of the 1,250-lb. A. P. Rocket Bomb Mk 50 and the Fuzes Mk 150 and Mk 151 are to be in accordance with existing regulations for bombs and fuzes, with the exception of the crate containing the rocket chamber which, as previously noted, is to be afforded the same stowage as smokeless powder.

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